OGIP Calibration Memo CAL/XTE/95-004

XTE
CALIBRATION FILES
IN THE HEASARC CALDB

edited by:

Ian M George, Lorraine Breedon,
Jim Lochner, Craig Markwardt, & M. F. Corcoran

Codes 660.2 & 664,
NASA/GSFC,
Greenbelt, MD20771

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SUMMARY

This document describes the *XTE* calibration datasets currently in the HEASARC calibration database.
Intended audience: XTE hardware & GOF teams, HEASARC programmers, authors of data analysis s/w and remote caldb-managers.

LOG OF SIGNIFICANT CHANGES TO THIS DOCUMENT

Release Date	**Sections Changed**	**Brief Notes**
1995 Feb 22	All	First Draft
1995 Oct 30	All	Added AO-1 NRA datasets
1996 Jan 03	2.4.1 & 2.4.2	Added pre-launch/test PCA e2c datasets
1996 Feb 06	2.3.2	Added post-launch PCA coll responses
1996 Feb 20	2.4.3	Added post-launch PCA C2E dataset
2001 Aug 28	2.4.4	Added post-launch PCA E2C dataset
2001 Aug 28	2.4.5	Added post-launch PCA E2C dataset
2001 Aug 28	2.4.6	Added post-launch PCA E2C dataset
2001 Aug 28	2.4.7	Added post-launch PCA E2C dataset
2001 Aug 28	2.4.8	Added post-launch PCA E2C dataset
2001 Aug 28	2.4.9	Added post-launch PCA E2C dataset
2001 Aug 28	2.4.10	Added post-launch PCA E2C dataset
2001 Aug 28	2.4.11	Added post-launch PCA E2C dataset
2011 May 6	2.6 & 2.7	Added PCA Breakdown History & SAA history file
2012 Aug 27	All	updates to xte caldb file lists (MFC)

Contents

Chapter 1

INTRODUCTION

1.1 Overview

This document is intended to provide notes on the origin, format, limitations *etc* of all *XTE* calibration datasets within the HEASARC calibration database (caldb).

In the rest of this chapter, the location and structure of the HEASARC caldb at NASA/GSFC is briefly described, along with references to other relevant documentation. All *XTE* PCA, HEXTE, & ASM datasets within the caldb at NASA/GSFC are then summarized in Chapters 2, 3 & 4 respectfully, with non-instrument specific datasets summarized in Chapter 5

1.1.1 Contact Person for Scientific Questions/Problems

Scientific questions, problems and comments regarding the contents of the datasets themselves should be addressed to Dr. Padi Boyd (`Patricia.T.Boyd.1@gsfc.nasa.gov`) of the XTE GOF.

1.2 The HEASARC Caldb at NASA/GSFC

The location, organization and contents of the HEASARC calibration database on-line at NASA/GSFC is summarized in OGIP Calibration Memo CAL/GEN/93-006 (available on-line as pdf and html versions).

1.2.1 Location

The HEASARC calibration database (CALDB) is physically located at the HEASARC at the NASA/Goddard Space Flight Center in Greenbelt, MD. The entire caldb directory tree is available to remote users via anonymous ftp or http. For more information, see CAL/GEN/93-006 available on-line as PDF and html versions.

1.2.2 Basic Structure

The contents of the `caldb` area is sub-divided between the following sub-directory trees:

- `data` - containing the calibration dataset directory tree.
- `software` - containing the `caltools` software tasks, the `callib` subroutine library and a number of other software-related items.
- `docs` - containing related calibration documentation

Here we only consider the `data` tree. It should be noted that access to certain caldb directory trees is also available from other areas of the `legacy` anonymous ftp account via symbolic links (see CAL/GEN/93-006, available on-line as postscript and html versions).

1.2.3 Calibration Data File Classes

The HEASARC caldb classifies files as 'Primary Calibration Files', 'Basic Calibration Files' and 'Calibration Product Files' (PCFs, BCFs & CPFs respectively; see also CAL/GEN/91-001, available on-line as postscript and html versions). PCFs are 'raw' ground and in-orbit calibration datasets not of immediate interest to most users as they are not directly required for (all but the most specialized) scientific data analysis tasks. These dataset are not considered here. BCFs contain the lowest level calibration datasets potentially required by downstrem software, and can be considered the 'atomic units' of the instrument calibration. CPFs contain 'convolutions' of the information stored within BCFs customized for a specific analysis task and/or scientific observation.

All BCF & CPF calibration files are organized using the scheme

`/caldb/data/`*mission*`/`*inst*

where *mission* & *inst* are the OGIP-standard names for the mission and instrument. For internal management purposes, a further division into *inst*`/bcf` and *inst*`/cpf` sub-directories is made in most cases. Non-instrument specific calibration datasets, including general spacecraft housekeeping information *etc*, can be found in the `/caldb/data/`*mission*`/mis` sub-directory.

1.3 Conventions used within this Document

Throughout this document, the hash (#) symbol is used as a wild-card in filenames to indicate several files are available with slightly different names. In all cases the detailed naming scheme, along with the characters which can be used to replace the # are described in the detailed description of the file set.

PLEASE NOTE: The filenames and locations of the calibration datasets described within this document were chosen by the XTE GOF at NASA/GSFC in collaboration with the instrument teams.

1.4 Acknowledgments

The information within this document could not have been compiled without the help of very many people within the *XTE* PCA, HEXTE & ASM instrument teams, to whom we owe an enormous debt. Wherever possible we acknowledge the direct source of the information within the text, but undoubtedly this may often under-represent the collective effort involved. We apologise to anybody who has inadvertently not been credited, and will be happy to add their name in the appropriate place(s).

Chapter 2

XTE PCA CALIBRATION FILES

2.1 Summary of Available Files

The PCA calibration files available under the

`/caldb/data/xte/pca/`*type*

directory tree are listed in Table 2.1. In many cases the actual files will be stored in sub-directories under this tree, as detailed below.

Note that the files listed as "good" in the most up-to-date Caldb index file are linked to on the "Caldb Supported Missions Page", `http://heasarc.gsfc.nasa.gov/docs/heasarc/caldb/caldb_supported_miss`
The last update to the PCA Caldb was update version 20120110, which was ingested into the HEASARC Caldb on Jan 11, 2012. The "good" Caldb files for this update are listed at `http://heasarc.gsfc.nasa.gov/docs/heasarc/caldb/data/xte/pca/index/cif_xte_pca_20120110.html`.

Table 2.1: Summary of *XTE* PCA calibration files available within the HEASARC Caldb

Filename	Description	Section
Basic Calibration Files (*type* = `bcf`)		
edsgcor_950818.fits	Pre-launch EDS Gain & Offsets (v4.3, build 4.3.2)	2.2.1
edsgcor_951230.fits	EDS Gain & Offsets for 1995 Dec 30 – 1996 Jan 18	2.2.2
edsgcor_960118.fits	EDS Gain & Offsets starting 1996 Jan 18	2.2.3
edsgcor_96feb27.fits	PCA EDS Gain & Offsets starting 27/02/96	
edsgcor_96mar25.fits	PCA EDS Gain & Offsets starting 25/03/96	
edsgcor_e04v00.fits	combination of edsgcor_951230.fits, edsgcor_960118.fits, edsgcor_96feb27.fits, edsgcor_96mar25.fits	
fov_all.fits	Pre-launch collresp for PCU0–4 combined	2.3.1
fov_pcu#.fits	Pre-launch collresps for each PCU	2.3.1
p#coll_96jun05	Collimator response for each PCU	2.3.2
pcacoll_96jun05	Collimator response for PCU0–4 combined	2.3.2
pca_c2e_96feb16.fits	Post-launch c2e params (methods 1, 2, & 3)	2.4.3
pca_e2c_e05v01.fits	energy to channel conversion, pcarmf v11.7	see Shaposhnikov et al. 2009
Calibration Product Files (*type* = `cpf`)		
5det_256ch_950403.rmf	(prelaunch) AO-1 NRA 256 chan RMF	2.5.2
5det_6ch_950403.rmf	(prelaunch) AO-1 NRA 6 chan RMF	2.5.1
5det_l#.rmf	(prelaunch) AO-1 NRA 256 chan RMF for each layer	2.5.3
pca_breakdown_hist_20120110.fits	PCA breakdown history file	
pca_breakdown_hist_20120110.gti	PCA breakdown history good time intervals	
pca_saa_history_20120104.fits	PCA SAA dosage history - v20120104	
pca_bkgd_#_e03v0#.mdl	PCA background model files	

An ASCII file listing all the PCA datasets marked as `good` within the Caldb (produced by a script periodically run automatically) is available as

`caldb/data/xte/pca/goodfiles.ascii`

An ASCII file listing all the PCA datasets which appear to be missing from or misplaced within the Caldb (produced by a script periodically run automatically) is available as:

`caldb/data/xte/pca/missingfiles.ascii`.

2.2 BCF: EDS Gain & Offsets

2.2.1 edsgcor_950818.fits

Location

caldb/data/xte/pca/bcf/eds

Status

PRE-LAUNCH – SUPERSEDED

Summary of File

Template file for EDS Gain and Offset adjustment command values derived from PCA calibration data.

1. All data are integer numbers in the range 0 to 255
2. Gain applied first - specified as `+-m/256` channels
3. Offset applied second - specified as `+-n` channels
4. EDS applies the following rules to the `computedc` channel value:
   - values are limited to the range 0 - 255
   - values below 0 and above 255 are considered "out of band"
   - values are rounded to the nearest integer
   - values exactly between two integer values are rounded up
   - Values of zero for Gain & Offset cause no change
5. Equation is: `new = [ old * ( 1 +  gain / 256 ) ] + offset`
6. Channel No. to keV, last line has A & B constants equation is `keV = [ ( Ch # ) * A ] + B` only applicable after gain corrections are done

Delivered to CALDB by:

Jim Lochner (XTE GOF) in FITS format on 1995 Nov 01, from an ASCII file (created 1995 June 23; `V_4.3, Build 4.3.2`) supplied by Barry Giles (PCA Team).

File Format

Instrument-specific (no multi-instrument OGIP standard)

Input Datasets, Assumptions, *etc*

See above

Points to Note

- See above

2.2.2 edsgcor_951230.fits

Location

caldb/data/xte/pca/bcf/eds

Status

CURRENT

Summary of File

As described in Section 2.2.1. This dataset is valid for 1995 Dec 30 – 1996 Jan 18.

Delivered to CALDB by:

Jim Lochner (XTE GOF) in FITS format on 1996 Jan 30,

File Format

Instrument-specific (no multi-instrument OGIP standard)

Input Datasets, Assumptions, *etc*

See Section 2.2.1

Points to Note

- See above

2.2.3 edsgcor_960118.fits

Location

caldb/data/xte/pca/bcf/eds

Status

CURRENT

Summary of File

As described in Section 2.2.1. This dataset is valid for 1996 Jan 18 –

Delivered to CALDB by:

Jim Lochner (XTE GOF) in FITS format on 1996 Jan 30,

File Format

Instrument-specific (no multi-instrument OGIP standard)

Input Datasets, Assumptions, *etc*

See Section 2.2.1

Points to Note

- See above

2.3 BCF: Collimator Responses

2.3.1 fov_all.fits & fov_pcu#.fits

Location

caldb/data/xte/pca/bcf/collresp/95aug07

Status

SUPERSEDED (Section 2.3.2)

Summary of File

A series of six files:

- five files conforming to the naming scheme `fov_pcu`*i*`.fits` containing the collimator response for PCU*i*
- a single file `fov_all.fits` containing the combined collimator response for the combined PCA array (ie PCU0–PCU4) assuming perfect alignment.

This is simulated data created by Tod Strohmayer (PCA Team) using `wtpcafov_en 1.0.1`. The response is given in terms of the Y,Z XTE coordinates. The X coordinate can be easily derived from these since the three components form a unit vector. Y, and Z are UNITLESS Note: ALPHA = Y, BETA = Z

Delivered to CALDB by:

Jim Lochner (XTE GOF) in standard format 1995 Jul/Aug.

File Format

CRSPVERS = 1992a (see CAL/GEN/92-019).

Input Datasets, Assumptions, *etc*

See above

Points to Note

- These are **simulated**, **pre-launch** datasets. and have been **superseded** (see Section 2.3.2)

2.3.2 p#coll_96feb01 & pcacoll_96feb01

Location

caldb/data/xte/pca/bcf/collresp/96feb01

Status

CURRENT

Summary of File

A series of six files:

- five files conforming to the naming scheme `p`*i*`coll_96feb01` containing the collimator response for PCU*i*
- a single file `pcacoll_96feb01` containing the combined collimator response for the combined PCA array (ie PCU0–PCU4) assuming in-orbit alignment.

Delivered to CALDB by:

Jim Lochner (XTE GOF) in standard format 1996 Feb 05.

File Format

CRSPVERS = 1992a (see CAL/GEN/92-019).

Input Datasets, Assumptions, *etc*

See above

Points to Note

- None

2.4 BCF: Channel-to-Energy Parameters

2.4.1 pca_c2e_95jun01.fits

Location

caldb/data/xte/pca/bcf/c2e/

Status

PRE-LAUNCH – SUPERSEDED (see Section 2.4.3)

Summary of File

Template file for PCA detector channel-to-energy conversion. Dataset contains dummy/nominal parameters for a linear conversion algorithm $E = P_1 + P_2 \times C$ where E is the energy, P_i is parameter i and C is the channel.

Delivered to CALDB by:

Created using `ftools/fcreate` by Ian M George (HEASARC) 1996 Jan 03 from values supplied by Keith Jahoda (PCA Team) via Jim Lochner (XTE GOF)

File Format

Instrument-specific (no multi-instrument OGIP standard)

Input Datasets, Assumptions, *etc*

LLD=63 data from linear fit to 5 or 6 alpha lines, 1 hour of background 1995 Jun 12 (PCU2, book 4, p.89 Xe HV = 88888)

Points to Note

- 1996 Jan 03
  - Note there are some very minor rounding errors introduced by `fcreate`
- 1996 Feb 06
  - This file was **renamed** (from `pca_c2e_lin_950601.fits`) and **moved** at the request of the XTE GOF at NASA/GSFC.

2.4.2 pca_c2e_95jun15.fits

Location

caldb/data/xte/pca/bcf/c2e/

Status

PRE-LAUNCH – SUPERSEDED (see Section 2.4.3)

Summary of File

Single file containing dummy/nominal parameters for PCU detector channel-to-energy conversions. Two sets of 5 extensions are available (one extension for each PCU), those using

- a linear conversion algorithm $E = P_1 + P_2 \times C$
- a quadratic conversion algorithm $E = P_1 + P_2 \times C + P_3 \times C^2$

where E is the energy, P_i is parameter i and C is the channel.

Delivered to CALDB by:

Created using `ftools/fcreate` by Ian M George (HEASARC) 1996 Jan 03 from values supplied by Keith Jahoda (PCA Team) via Jim Lochner (XTE GOF)

File Format

Instrument-specific (no multi-instrument OGIP standard)

Input Datasets, Assumptions, *etc*

- extensions using the linear conversion algorithm
  LLD=63 data from linear fit to 6 alpha lines plus L-alpha in 3 hours calibration 1995 Jun 23 (PCU2, book 4, p.99 Xe HV = 87778)
  LLD=64 data from linear fit to Fe55 line in Propane layer 1995 Jun 23 (PCU2, book 4, p.98, intercept taken to be 0 ... which is a guess; if electronic should use offset from Xenon data)
- extensions using the quadratic conversion algorithm
  LLD=63 data from quadratic fit to 6 alpha lines plus L-alpha in 3 hours calibration 1995 Jun 23 (PCU2, book 4, p.99 Xe HV = 87778)

Points to Note

- 1996 Jan 03
  - Note there are some very minor rounding errors introduced by `fcreate`
- 1996 Feb 06
  - This file was created by **appending** two files which previously existed in the CALDB (`pca_c2e_lin_950615.fits` & `pca_c2e_quad_950615.fits` and **moved** at the request of the XTE GOF at NASA/GSFC.

2.4.3 pca_c2e_96feb16.fits

Location

caldb/data/xte/pca/bcf/c2e/

Status

CURRENT

Summary of File

Single file containing dummy/nominal parameters for PCU detector channel-to-energy conversions. Three sets of 5 extensions are available (one extension for each PCU), those using

- `method-1` – a linear conversion algorithm $E = P_1 + P_2 \times C$
- `method-2` – a quadratic conversion algorithm $E = P_1 + P_2 \times C + P_3 \times C^2$
- `method-3` – a quadratic conversion algorithm, but with jumps at the Xenon edges

where E is the energy, P_i is parameter i and C is the channel.

Delivered to CALDB by:

Created using `ftools/fcreate` by Ian M George (HEASARC) 1996 Feb 20 from values supplied by Keith Jahoda (PCA Team) via Jim Lochner (XTE GOF)

File Format

Instrument-specific (no multi-instrument OGIP standard)

Input Datasets, Assumptions, *etc*

- `method-1` – Fits to 6 energies (Fe from CasA plus 5 Americium peaks, all 960120; ignored the peak at 16 keV which blends two lines offset adjusted to be correct below L edge, data stored in `/pcasrv2e/keith/OnOrbitCal/960120` LLD=63 data from fits to on orbit std1 data; BNL 2 p. 82. 6 energies from 13.9 to 59.4
- `method-2` – Fits to 6 energies (Fe from CasA plus 5 Americium peaks, all 960120; ignored the peak at 16 keV which blends two lines offset adjusted to be correct below L edge, fits to data in `OnOrbitCal/960208` done 96feb13
- `method-3` – Fits to 6 energies (Fe from CasA plus 5 Americium peaks, all 960120; ignored the peak at 16 keV which blends two lines offset adjusted to be correct below L edge, data stored in `/pcasrv2e/keith/OnOrbitCal/960120`

Points to Note

- 1996 feb 20
  - Note there are some very minor rounding errors introduced by `fcreate`

2.4.4 pca_e2c_e03v00.fits

Location

caldb/data/xte/pca/bcf/e2c/

Status

SUPERSEDED

Summary of File

Data file for energy to channel conversion.

version 1.06 delivered 4-25-96

Delivered to CALDB by:

Created using `ftools/fcreate` by Keith Jahoda (PCA Team) via Jim Lochner (XTE GOF)

File Format

Instrument-specific (no multi-instrument OGIP standard)

Input Datasets, Assumptions, *etc*

NOTES (Keith Jahoda, PCA Team, 1996 Apr 25)

960425 - for HV=5 fits to Xe L + five lines from Am

version 1.06 delivered 4-25-96

ALGORITHM: energy = parm1 + parm2*ch + par(3)*ch**2

NOTES (James Lochner, XTE GOF, 1996 Apr 25)

Dataset constructed by hand using fcreate. Note there some very minor rounding errors introduced by fcreate.

Points to Note

2.4.5 pca_e2c_e03v01.fits

Location

caldb/data/xte/pca/bcf/e2c/

Status

SUPERSEDED

Summary of File

Data file for energy to channel conversion.

version 2.0 delivered Dec 2, 1996

Delivered to CALDB by:

Created using `ftools/fcreate` by Keith Jahoda (PCA Team) via Jim Lochner (XTE GOF)

File Format

FITS with caldb keywords

Input Datasets, Assumptions, *etc*

NOTES (Keith Jahoda, PCA Team, 1996 Dec 2)

ALGORITHM: channel = parm1 + parm2*(E/W(E)) + parm3*(E/W(E))**2 E = energy

W(E) = the energy required to create one thermal electron.

Values derived in /data/pcasrv2b/keith/HV5_energyscale by running ech_961112.kumac, many-fit.kumac, and vvfit.kumac on data collected by layer in the 5 detectors. These values were fit to eprime - This model seems not quite correct yet. 11-26-96

NOTES (James Lochner, XTE GOF, 1996 Dec 10)

Dataset constructed by hand using fcreate. Note there some very minor rounding errors introduced by fcreate.

Points to Note

2.4.6 pca_e2c_e03v02.fits

Location

caldb/data/xte/pca/bcf/e2c/

Status

SUPERSEDED

Summary of File

Data file for energy to channel

version 2.01 delivered Feb 28, 1997

Delivered to CALDB by:

Created using `ftools/fcreate` by Keith Jahoda (PCA Team) via Jim Lochner (XTE GOF)

File Format

FITS with caldb keywords

Input Datasets, Assumptions, *etc*

NOTES (Keith Jahoda, PCA Team, 1997 Feb 28)

ALGORITHM: channel = parm1 + parm2*(E/W(E)) + parm3*(E/W(E))**2

E = energy

W(E) = the energy required to create one thermal electron. Values derived in /data/pcasrv2b/keith/HV5_energyscale by running ech_961112.kumac, manyfit.kumac, and vvfit.kumac on data collected by layer in the 5 detectors. These values were fit to eprime - This model seems not quite correct yet. 11-26-96

NOTES (James Lochner, XTE GOF, 1997 Feb 28)

Dataset constructed by hand using fcreate. Note there some very minor rounding errors introduced by fcreate.

Points to Note

2.4.7 pca_e2c_e03v03.fits

Location

caldb/data/xte/pca/bcf/e2c/

Status

SUPERSEDED

Summary of File

Data file for energy to channel

(Version for pcarmf v2.1.2)

Delivered to CALDB by:

Created using `ftools/fcreate` by Keith Jahoda (PCA Team) via Jim Lochner (XTE GOF)

File Format

FITS with caldb keywords

Input Datasets, Assumptions, *etc*

NOTES (Keith Jahoda, PCA Team, 1997 April 15)

Data file for energy to channel

(Version for pcarmf v2.1.2)

ALGORITHM: channel = parm1 + parm2*(E/W(E)) + parm3*(E/W(E))**2

E = energy,

W(E) = the energy required to create one thermal electron.

W(E) is taken from T.H.V.T. Dias et al. Phys Rev A, 48, 2887 (1993) and personnal communication.

(THE FACTOR OF 22 makes the apparent X-axis in XSPEC $\approx$ energy)

NOTES (James Lochner, XTE GOF, 1997 April 15)

FITS Data set constructed by fcreate. Note that there are some very minor rounding errors introduced by fcreate.

Points to Note

2.4.8 pca_e2c_e03v031.fits

Location

caldb/data/xte/pca/bcf/e2c/

Status

SUPERSEDED

Summary of File

Data file for energy to channel (Version for pcarmf v2.1.2)

Delivered to CALDB by:

Created using `ftools/fcreate` by Keith Jahoda (PCA Team) via Jim Lochner (XTE GOF)

File Format

FITS with caldb keywords

Input Datasets, Assumptions, *etc*

NOTES (Keith Jahoda, PCA Team, 1997 April 15)

ALGORITHM: channel = parm1 + parm2*(E/W(E)) + parm3*(E/W(E))**2

E = energy,

W(E) = the energy required to create one thermal electron.

W(E) is taken from T.H.V.T. Dias et al. Phys Rev A, 48, 2887 (1993) and personnal communication.

(THE FACTOR OF 22 makes the apparent X-axis in XSPEC $\approx$ energy)

NOTES (James Lochner, XTE GOF, 1997 April 15)

FITS Data set constructed by fcreate. Note that there are some very minor rounding errors introduced by fcreate.

Points to Note

2.4.9 pca_e2c_e03v04.fits

Location

caldb/data/xte/pca/bcf/e2c/

Status

SUPERSEDED

Summary of File

Data file for energy to channel (Version for pcarmf v3.0)

Delivered to CALDB by:

Created using `ftools/fcreate` by Keith Jahoda (PCA Team) via Jim Lochner (XTE GOF)

File Format

FITS with caldb keywords

Input Datasets, Assumptions, *etc*

NOTES (Keith Jahoda, PCA Team, 1998 March 2)

ALGORITHM: channel = parm1 + parm2*(E/W(E)) + parm3*(E/W(E))**2

E = energy,

W(E) = the energy required to create one thermal electron.

W(E) is taken from T.H.V.T. Dias et al. Phys Rev A, 48, 2887 (1993) and personnal communication.

(THE FACTOR OF 22 makes the apparent X-axis in XSPEC $\approx$ energy)

For further information on the construction and characteristics of PCA response matrices, see http://lheawww.gsfc.nasa.gov/docs/xray/xte/pca

NOTES (James Lochner, XTE GOF, 1998 March 2)

FITS Data set constructed by fcreate. Note that there are some very minor rounding errors introduced by fcreate.

Points to Note

2.4.10 pca_e2c_e04v01.fits

Location

caldb/data/xte/pca/bcf/e2c/

Status

SUPERSEDED

Summary of File

Data file for energy to channel (Version for pcarmf v7.01)

Delivered to CALDB by:

Created using `ftools/fcreate` by Keith Jahoda (PCA Team) via Jim Lochner (XTE GOF)

File Format

FITS with caldb keywords

Input Datasets, Assumptions, *etc*

NOTES (Keith Jahoda, PCA Team, 1999 December 12)

ALGORITHM: channel = parm1 + parm2*(E/W(E)) + parm3*(E/W(E))**2

E = energy, W(E) = the energy required to create one thermal electron.

W(E) is taken from T.H.V.T. Dias et al. Phys Rev A, 48, 2887 (1993) and personnal communication.

(THE FACTOR OF 22 makes the apparent X-axis in XSPEC $\approx$ energy)

The value of parm4 is the ratio of parm2 in Epoch 4 to parm2 in Epoch 3. This is included so that the gain and offset parameters, introduced via the parameter file, can be translated to Epoch 4 from the Epoch 3 values.

For further information on the construction and characteristics of PCA response matrices, see http://lheawww.gsfc.nasa.gov/docs/xray/xte/pca

NOTES (James Lochner, XTE GOF, 1998 March 2)

FITS Data set constructed by fcreate. Note that there are some very minor rounding errors

introduced by fcreate.

Points to Note

2.4.11 pca_e2c_e05v01.fits

Location

caldb/data/xte/pca/bcf/e2c/

Status

SUPERSEDED

Summary of File

Data file for energy to channel; pcarmf v7.10

Delivered to CALDB by:

Created using `ftools/fcreate` by Keith Jahoda (PCA Team) via Padi Boyd (XTE GOF)

File Format

FITS with caldb keywords

Input Datasets, Assumptions, *etc*

ALGORITHM: channel = $A + B * (E/W(E)) + C * (E/W(E))^2 + D * (E/W(E))^3$

E = energy,

W(E) = the energy required to create one thermal electron. (taken from T.H.V.T. Dias et al. Phys Rev A, 48, 2887 (1993) and personal communication.) (factor of 22 makes the apparent X-axis in XSPEC $\approx$ energy)

Day_Offset = (Day - Ref_Day) [Ref_Day from parameter file]

A = PARM1 + PARM5 * Day_Offset + PARM7 * Day_Offset^2

B = PARM2 + (PARM6 * Day_Offset + PARM8 * Day_Offset^2) * PARM4

C = PARM3

D = PARM9

PARM4 = PARM2(current epoch) / PARM2(epoch 3)

Model assumes that gain drift can be fit (in epoch 3 space) as the sum of a linear plus quadratic term. The whole shift is corrected by the relative channel/kev term (PARM4).

FITS Data set constructed using fcreate. Note that there are some very minor rounding errors introduced by fcreate.

For further information on the construction and characteristics of PCA response matrices, see http://lheawww.gsfc.nasa.gov/docs/xray/xte/pca

Points to Note

2.5 CPF: PCA Detector Redistribution Matrices

2.5.1 5det_6ch_950403.rmf

Location

caldb/data/xte/pca/pca/cpf/responses/95apr03

Status

CURRENT

Summary of File

WARNING: THIS IS A PREFLIGHT MATRIX

This matrix is copy of that supplied as part of the XTE AO-1 NRA. The matrix consists of (only) 6 channels, matched to the 6 channel PCA spectrum discussed in the PCA Feasibility chapter of the NRA and requested on the proposal form.

Delivered to CALDB by:

Jim Lochner (XTE GOF) in FITS format on 1995 Oct 30, from an indentically named file in the XTE NRA area within the HEASARC's anonymous ftp area.

File Format

RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

This dataset is appropriate for all 5 PCUs combined assuming perfect alignment.

No propane response is included.

Points to Note

- Ian M George (HEASARC) 1995 Oct 30)
  - WARNING: This is a 6-channel preflight matrix (all PCUs combined)
  - This dataset was designed for use with the ARF `5det_6ch_950403.arf`
  - Used with `XSPEC`, this matrix can be used to provide inputs to the `RECOMMD` program, as an alternative to the output provided by `PIMMS`. (This is especially useful for spectral models not supported by `PIMMS`)

2.5.2 5det_256ch_950403.rmf

Location

caldb/data/xte/pca/pca/cpf/responses/95apr03

Status

CURRENT

Summary of File

WARNING: THIS IS A PREFLIGHT MATRIX

This matrix is copy of that supplied as part of the XTE AO-1 NRA. The matrix consists of 256 channels (1 thru 256), and AO-1 NRA recommended its use when determining energy spectra of moderate to bright sources.

Delivered to CALDB by:

Jim Lochner (XTE GOF) in FITS format on 1995 Oct 30, from an indentically named file in the XTE NRA area within the HEASARC's anonymous ftp area.

File Format

RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

This dataset is appropriate for all 5 PCUs combined assuming perfect alignment.

No propane response is included.

Points to Note

- Ian M George (HEASARC) 1995 Oct 30)
  - WARNING: This is a 256-channel preflight matrix (all PCUs combined)
  - This dataset was designed for use with the ARF `5det_256ch_950403.arf`

2.5.3 5det_l#.rmf

Location

caldb/data/xte/pca/pca/cpf/responses/95apr03

Status

CURRENT

Summary of Files

WARNING: THESE ARE PREFLIGHT MATRICES

Three 256 channel matrices (`5det_l1.rmf`, `5det_l2.rmf`, `5det_l3.rmf`), one for each layer of the PCA, supplied as part of the XTE AO-1 NRA.

Delivered to CALDB by:

Jim Lochner (XTE GOF) in FITS format on 1995 Oct 30, from an indentically named file in the XTE NRA area within the HEASARC's anonymous ftp area.

File Format

RMFVERSN = 1992a (see CAL/GEN/92-002).

Input Datasets, Assumptions, *etc*

This dataset is appropriate for all 5 PCUs combined assuming perfect alignment.

Points to Note

- Ian M George (HEASARC) 1995 Oct 30)
  - WARNING: These are 256-channel preflight matrices (all PCUs combined)
  - These datasets were designed for use with the ARFs `5det_l#.arf`

2.6 CPF: PCA Breakdown History

2.6.1 pca_breakdown_hist_YYYMMDD.fits

Location

/caldb/data/xte/pca/cpf/breakdown

Status

CURRENT

Summary of File

Since shortly after launch, the PCA has experienced high voltage breakdowns. During the breakdown, and for a "resting" period afterward, the data from that PCU is not useful for science. The PCA team has released two new PCA breakdown history products, which allow observers to remove breakdown events automatically. The two different files allow you to filter at the filter-file stage (via a new option to the XTEFILT task) or at the extractor stage (via a new good-time interval file). The new files are updated periodically, typically once per month. See the PCA breakdown recipe for more information about breakdowns and how these files can be used to remove annoying breakdown events from RXTE PCA data.

Each PCU is tracked separately. The `TIME_SINCE_BREAK` column indicates the time since/until a break-down in any PCU. This file contains a list of the time since the occurrence of a breakdown as a positive number. The file also lists the time until the next breakdown as a negative number.

This file is meant to be used with the XTE tool XTEFILT.

Delivered to CALDB by:

Craig Markwardt, RXTE GOF; updates are delivered roughly once per month.

File Format

```
CCNM0001= 'PCA_BREAKDOWN_HIST'
```

The format of this file adheres to "The Proposed Timing FITS File Format for High Energy Astrophysics Data" (OGIP/93-003)

Input Datasets, Assumptions, *etc*

Points to Note

2.6.2 pca_breakdown_hist_YYYYMMDD.gti

Location

/caldb/data/xte/pca/cpf/breakdown

Status

CURRENT

Summary of File

Since shortly after launch, the PCA has experienced high voltage breakdowns. During the breakdown, and for a "resting" period afterward, the data from that PCU is not useful for science. The PCA team has released two new PCA breakdown history products, which allow observers to remove breakdown events automatically. The two different files allow you to filter at the filter-file stage (via a new option to the XTEFILT task) or at the extractor stage (via a new good-time interval file). The new files are updated periodically, typically once per month. See the PCA breakdown recipe for more information about breakdowns and how these files can be used to remove annoying breakdown events from RXTE PCA data.

This file contains 6 extensions. Each extension is in the Standard Good Time Interval (STDGTI) format. The first extension is a conservative time filter which removes times near a breakdown in any PCU. The remaining five extensions are time filters for the individual PCUs. The YYYYMMDD denotes the date of the latest file update.The YYYYMMDD denotes the date of the latest file update

Delivered to CALDB by:

Craig Markwardt, RXTE GOF; updates are delivered roughly once per month.

File Format

```
CNM0001 = 'STDGTI  '
HDUCLASS= 'OGIP    '
HDUCLAS1= 'GTI     '
HDUCLAS2= 'ALL     '
```

The format of this file adheres to "The Proposed Timing FITS File Format for High Energy Astrophysics Data" (OGIP/93-003)

Input Datasets, Assumptions, *etc*

Points to Note

2.7 CPF: SAA History File

2.7.1 pca_saa_history_YYYYMMDD.fits

Location

ftp://legacy.gsfc.nasa.gov/caldb/data/xte/pca/cpf/saahist/

Status

CURRENT

Summary of File

The PCA background is a function of time since SAA. There is radioactivation within the instrument, which decays on various timescales. The famous "240" minute timescale has never been identified with a particular element, but it is used in the L7/240 faint model. The bright model actually uses two activation components. To get an accurate estimate of the amount of activation, the HEXTE particle monitor is used, which remains on even during SAA passages. The PCA instrument itself is off during SAA passes, but the activation persists for several hours afterward.

Estimates of the PCA background are computed using the pcabackest task, a model file, and a summary of the SAA passages. The SAA passes are stored in the "SAA history" file. This file is nominally updated daily in the XTE SOF using HEXTE particle monitor data. The history file records for each SAA pass the cumulative dose (in units of particle monitor counts) and the time of peak count rate.

Delivered to CALDB by:

Craig Markwardt, RXTE GOF; updates are delivered roughly once per month.

File Format

```
CCNM0001= 'PCA_SAA_HIST_DATA'  / CALDB Code: PCA SAA dose history
```

The format of this file adheres to "The Proposed Timing FITS File Format for High Energy Astrophysics Data" (OGIP/93-003)

The YYYYMMDD gives the date of the file update.

Input Datasets, Assumptions, *etc*

Points to Note

See the description of problems and implemented solutions given on the PCA SAA History and Background Problems, available from the RXTE GOF website.

Chapter 3

XTE HEXTE CALIBRATION FILES

3.1 Summary of Available Files

The *XTE* HEXTE calibration files available under the

`/caldb/data/xte/hexte/`*type*

directory tree are listed in Table 3.1. In many cases the actually files will be stored in sub-directories under this tree, as detailed in the corresponding detailed description.

Table 3.1: Summary of *XTE* HEXTE calibration files available within the HEASARC Caldb

Filename Description Section
Basic Calibration Files (*type* = `bcf`) *None* **Calibration Product Files** (*type* = `cpf`) *None*

An ASCII file listing all the HEXTE datasets marked as `good` within the Caldb (produced by a script periodically run automatically) is available as

`caldb/data/xte/hexte/goodfiles.ascii`

An ASCII file listing all the HEXTE datasets which appear to be missing from or misplaced within the Caldb (produced by a script periodically run automatically) is available as

`caldb/data/xte/hexte/missingfiles.ascii`.

Obviously this file should be empty. If you find it not to be so, please e-mail the Caldb Hot-seat at:
`caldbhelp@ascasrv.gsfc.nasa.gov`

Chapter 4

XTE ASM CALIBRATION FILES

4.1 Summary of Available Files

The *XTE* ASM calibration files available under the

`/caldb/data/xte/asm/`*type*

directory tree are listed in Table 4.1. In many cases the actually files will be stored in sub-directories under this tree, as detailed in the corresponding detailed description.

Table 4.1: Summary of *XTE* ASM calibration files available within the HEASARC Caldb

Filename Description Section
Basic Calibration Files (*type* = `bcf`) *None* **Calibration Product Files** (*type* = `cpf`) *None*

An ASCII file listing all the ASM datasets marked as `good` within the Caldb (produced by a script periodically run automatically) is available as

`caldb/data/xte/asm/goodfiles.ascii`

An ASCII file listing all the ASM datasets which appear to be missing from or misplaced within the Caldb (produced by a script periodically run automatically) is available as

`caldb/data/xte/asm/missingfiles.ascii`.

Obviously this file should be empty. If you find it not to be so, please e-mail the Caldb Hot-seat at:
`caldbhelp@ascasrv.gsfc.nasa.gov`

Chapter 5

XTE MISCELLANEOUS CALIBRATION FILES

5.1 Summary of Available Files

The miscellaneous non-instrument specific & s/c-related calibration files available under the

`/caldb/data/xte/mis/`*type*

directory tree are listed in Table 5.1. In many cases the actually files will be stored in sub-directories under this tree, as detailed in the corresponding detailed description.

Table 5.1: Summary of *XTE* MIS calibration files available within the HEASARC Caldb

Filename Description Section
Basic Calibration Files (*type* = `bcf`) *None* **Calibration Product Files** (*type* = `cpf`) *None*

An ASCII file listing all the *XTE* miscellaneous non-instrument specific datasets marked as `good` within the Caldb (produced by a script periodically run automatically) is available as

`caldb/data/xte/mis/goodfiles_xte_pca.tar.ascii`